OPERATION
AND
SERVICE MANUAL

105/CA 2358

MODEL E-1/E-1M
PLUG-IN
OSCILLATOR

105/CA 2358

telonic™

NEW LOCATION
TELONIC INDUSTRIES, INC.
BOX 277
LAGUNA BEACH, CALIFORNIA
92652

TEL (317) 787-3231 TWX-810-341-3202

OPERATION
AND
SERVICE MANUAL
T.O.S. NO. 120C

105/CA 2358

MODEL E-1/E-1M
PLUG-IN
OSCILLATOR

telonic™
TELONIC INSTRUMENTS
A Division of Telonic Industries, Inc.
60 N. First Avenue
Beech Grove, Indiana 46107

TEL (317) 787-3231 TWX-810-341-3202

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INSTRUMENTS; Division of Telonic Industries, Inc. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble, plus the MODEL AND SERIAL NUMBERS of the unit must be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not. Contact TELONIC INSTRUMENTS at Post Office Box 87, Beech Grove, Indiana 46107 or your local TELONIC representative.

See back page of this manual

CONVERSION INFORMATION

Commencing with equipment shipped after about July 22, 1963, certain modifications have been incorporated in the Telonic SM-2000 plug-in series, and in the Telonic SM-2000 control chassis. These modifications may render the units incompatible with those previously shipped unless the earlier instruments are modified also. The equipment in which these modifications have been made can be identified by the letter "A" prefixed to the serial number.

Units not so identified must be modified if they are to be compatible with instruments now being shipped. The modifications to be made are listed below, divided into two groups - those to be made to earlier SM-2000's and those to be made to earlier plug-ins.

SM-2000 CHANGES

1. On J601, remove all wires presently connected to pin 8 and reconnect them at pin 7; remove the jumper between pins 7 and 8.

2. Using shielded wire, type RG-174/U or equal, connect pin 8 of J601 to the printed circuit board land which leads to pin 1, V303. Ground the shield by connecting it to a convenient ground land nearby.

3. Prefix the letter "A" to the serial number of the instrument.

PLUG-IN CHANGES

1. On P601 remove all wires presently connected to Pin 8 and reconnect them at pin 7; remove the jumper between pins 7 and 8 if one is connected.

2. Prefix the letter "A" to the serial number of the instrument, if none is prefixed.

Changing the serial number of the instrument is as important in the modification as are the electrical requirements, as the ability to identify a unit as having been or not having been modified is involved.

SECTION I . . SPECIFICATIONS

INTRODUCTION

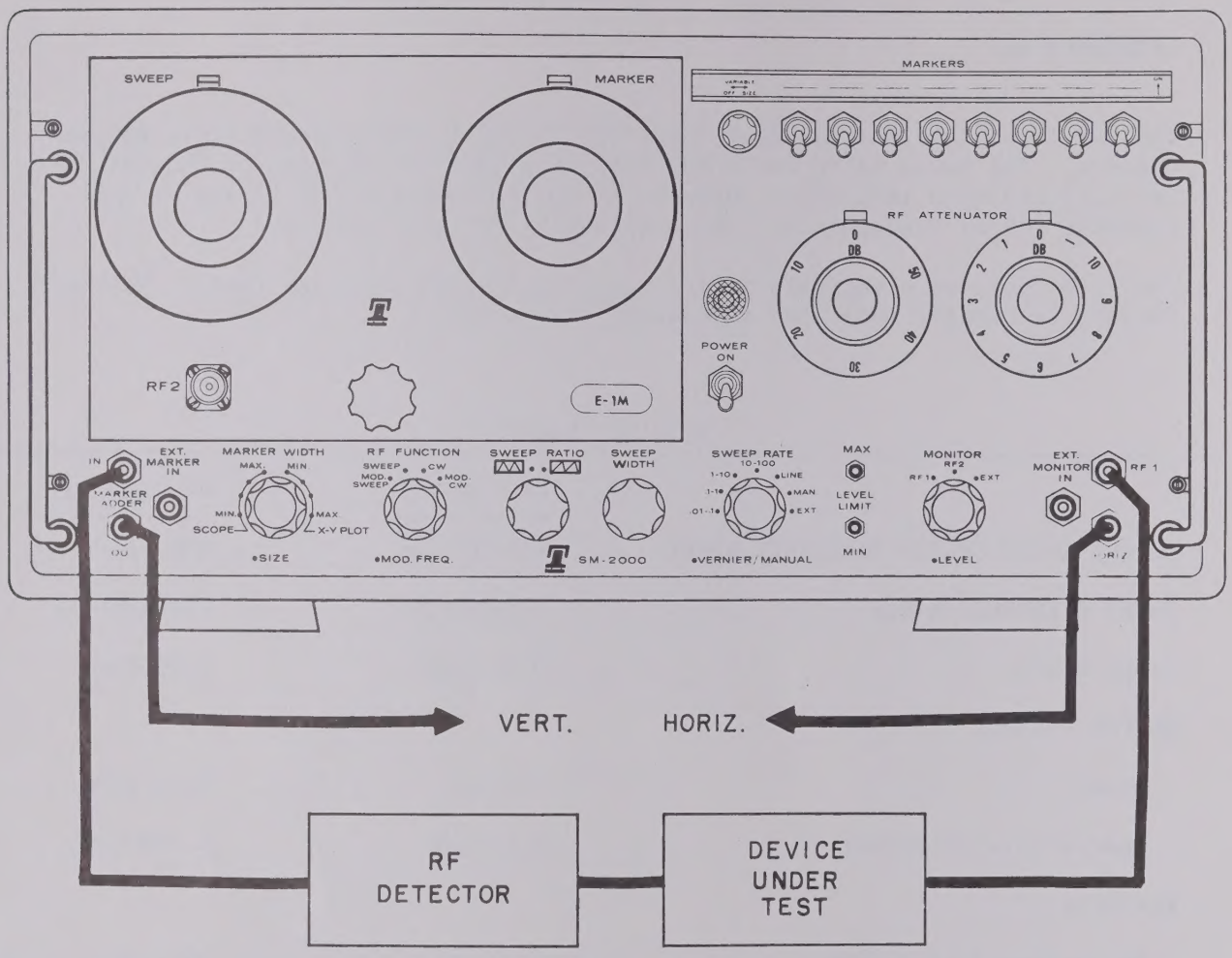
The E-1 is a plug-in sweep oscillator for use with designated Telonic Control Chassis. The sweep ratio and sweep rate functions of the control chassis are not utilized with this unit. Outputs at the fundamental (RF 1) and second harmonic (RF 2) frequency of the sweep oscillator are provided.

The E-1M includes a variable marker covering the entire sweep range. This difference is clearly indicated throughout the manual.

SPECIFICATIONS

	RF 1 OUTPUT	RF 2 OUTPUT
CW AND SWEEP CENTER FREQUENCY RANGE	460-920 Mc	920-1840 Mc
SWEPT FREQUENCY RANGE	435-970 Mc	870-1940 Mc
SWEEP WIDTH	0.02-10%	0.02-10%
OUTPUT VOLTAGE		
Sweep	1 vrms	0.25 vrms
Approximate CW Output	0.5 vrms	0.125 vrms
FLATNESS		
At Maximum Sweep Width	±1.0 db	±1.0 db
Overall	±1.0 db	±1 db
LINEARITY	1.4:1 or better	1.4:1 or better
VARIABLE MARKER (E-1M only)		
Frequency Range	435-970 Mc	870-1940 Mc
Accuracy	±0.3%	±0.3%
VERNIER RF LEVEL CONTROL RANGE		
Sweep and CW	0-6 dB	0-6 dB
Mod Sweep and Mod CW	0-3 dB	0-3 dB

SECTION II . . OPERATING INSTRUCTIONS



GENERAL

DESCRIPTION OF FRONT PANEL

SWEEP — The sweep dial, which sets the center frequency of the sweep oscillator by means of a variable capacitor.

MARKER — The variable marker dial, calibrated in two ranges to cover the full swept range of the unit. This control adjusts frequency by varying the length of a tuned line.

RF 2 — The output at this connector is at the second harmonic of the sweep oscillator frequency.

GENERAL

1. Make sure the control chassis power is OFF before inserting the plug-in oscillator into the Control Chassis. If the power is ON, transient voltages may damage diodes in the units. Insert plug-in oscillator and secure it in the chassis by tightening the fastening rod with the knob in the lower center of the front panel.

2. Make connections to the scope (or recorder), the device under test, and RF Detector as shown. All connectors located on the control chassis are "BNC" type. The RF 2 connector on the E-1 is "N" type. It is recommended that RG Cable be used for all connections to insure good ground connections and to minimize hum, leakage, and spurious signal pickup. The cable used to connect the RF output to the device under test should have a characteristic impedance of 50Ω. If the input impedance of the device under test is other than 50Ω, a matching network should be used to insure a constant input signal.

3. Connect the device under test to the RF 1 output on the control chassis or to the RF 2 output on the plug-in oscillator as appropriate for the frequency range of the test circuit.

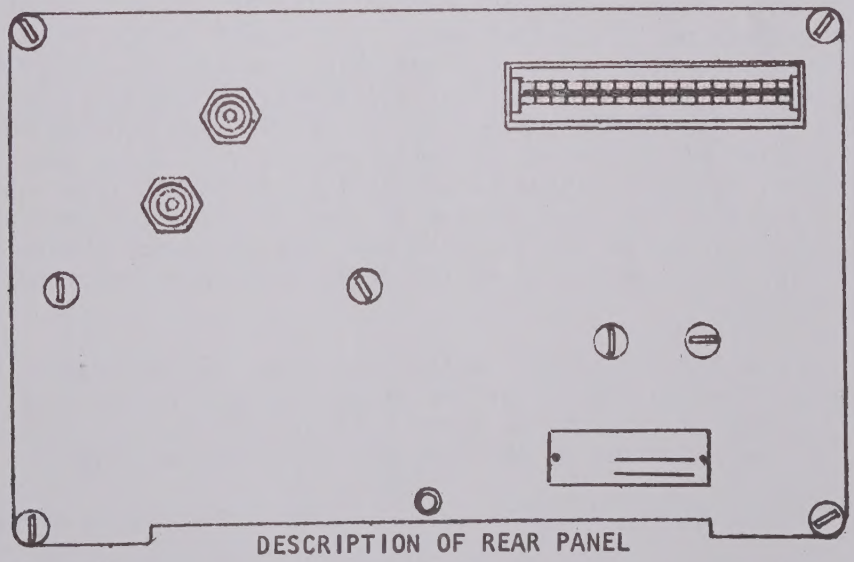
4. Refer to the manual for the Control Chassis for additional instructions. NOTE: To insure a constant amplitude output signal, the LEVEL MAX and MIN Controls should be set as prescribed in the control chassis manual and in the CALIBRATION PROCEDURE of this manual. These adjustments vary with the individual oscillator and with the output used.

5. To insure proper operation of both units, refer to Section IV (CALIBRATION PROCEDURE) of both manuals.

6. Proceed in accordance with recommendations of the manufacturer of the device under test concerning alignment, adjustment, and tests.

*See Telonic literature for suitable detector for this use.

DRAWING OF REAR PANEL



DESCRIPTION OF REAR PANEL

The three electrical connectors on the rear panel are:

Two BNC plugs, which mate with BNC jacks on the Control Chassis. These are the RF output connector (RF 1 frequency) and variable marker (RF) output.

A 32-contact plug which makes the other electrical contacts necessary through a mating jack on the control chassis.

SECTION III .. GENERAL DESCRIPTION

GENERAL

This plug-in oscillator has one RF output at the fundamental frequency of a tuned-line oscillator and another at the second harmonic. Center frequency tuning is accomplished by variable capacitors across the line.

The variable marker is produced by a CW oscillator which is tunable on the front panel. Variable tuned-line circuitry is used between plate and grid.

SWEEP OSCILLATOR

The sweep oscillator employs a 6AF4A in a tuned line type oscillator circuit. The fundamental frequency of the sweep oscillator is the RF 1 output frequency indicated in the Specifications. The RF 2 output is the result of harmonic generation in a non-linear device. Center frequency tuning is accomplished by precision machined capacitors whose shaft is ganged to a tunable band-pass filter which automatically tracks the second harmonic of the sweep oscillator. The band pass of the tuned filter is over 10% of center frequency, thereby allowing sufficient coverage of the sweep oscillator at maximum sweep width with high enough Q to obtain up to 0.25 volts of the second harmonic output and to reduce the spurious output to practically zero.

A linear sweep (frequency change versus horizontal display) is provided by variable inductances which are sine wave mechanically driven by a motor secured at the base of the sweep oscillator assembly. Inductance change occurs when a silver strap mounted on a fiber glass cylinder vibrates and cuts the flux path of the tuned lines. The rate of vibration is fixed at 60 cycles (line frequency) and the amplitude is controllable by the control chassis and plug-in SWEEP WIDTH Controls. The position of this strap on the fiber glass cylinder and in relation to the tuned lines is carefully adjusted at the factory for optimum linearity and sweep width. Since a sine wave voltage is used to drive the motor and horizontal deflection plates of the oscilloscope, the frequency change versus horizontal deflection trace appearing on the scope represents the true linearity of the sweep oscillator.

The RF 1 signal is coupled to the RF 1 output connector on the Control Chassis front panel through a monitor block and the RF attenuators in the control chassis. The RF 2 output is coupled through the tuned band-pass filter and a monitor, both in the plug-in, to the connector on the front panel of the oscillator.

See the Control Chassis Manual for discussion of monitoring and leveling action.

VARIABLE MARKER

The variable marker oscillator uses a 6AF4 tube, and is tuned by adjusting its tuned lines. The tuning range of the marker is sufficient to cover the entire range of the sweep oscillator. A 5:1 vernier drives the marker dial which is individually calibrated to an accuracy of 0.3%.

The RF output from the variable marker oscillator is then fed into a crystal diode mixer in the Control Chassis, where it is mixed with a sample of the sweep oscillator signal. The resultant birdy is then fed into the birdy-by-pass amplifier.

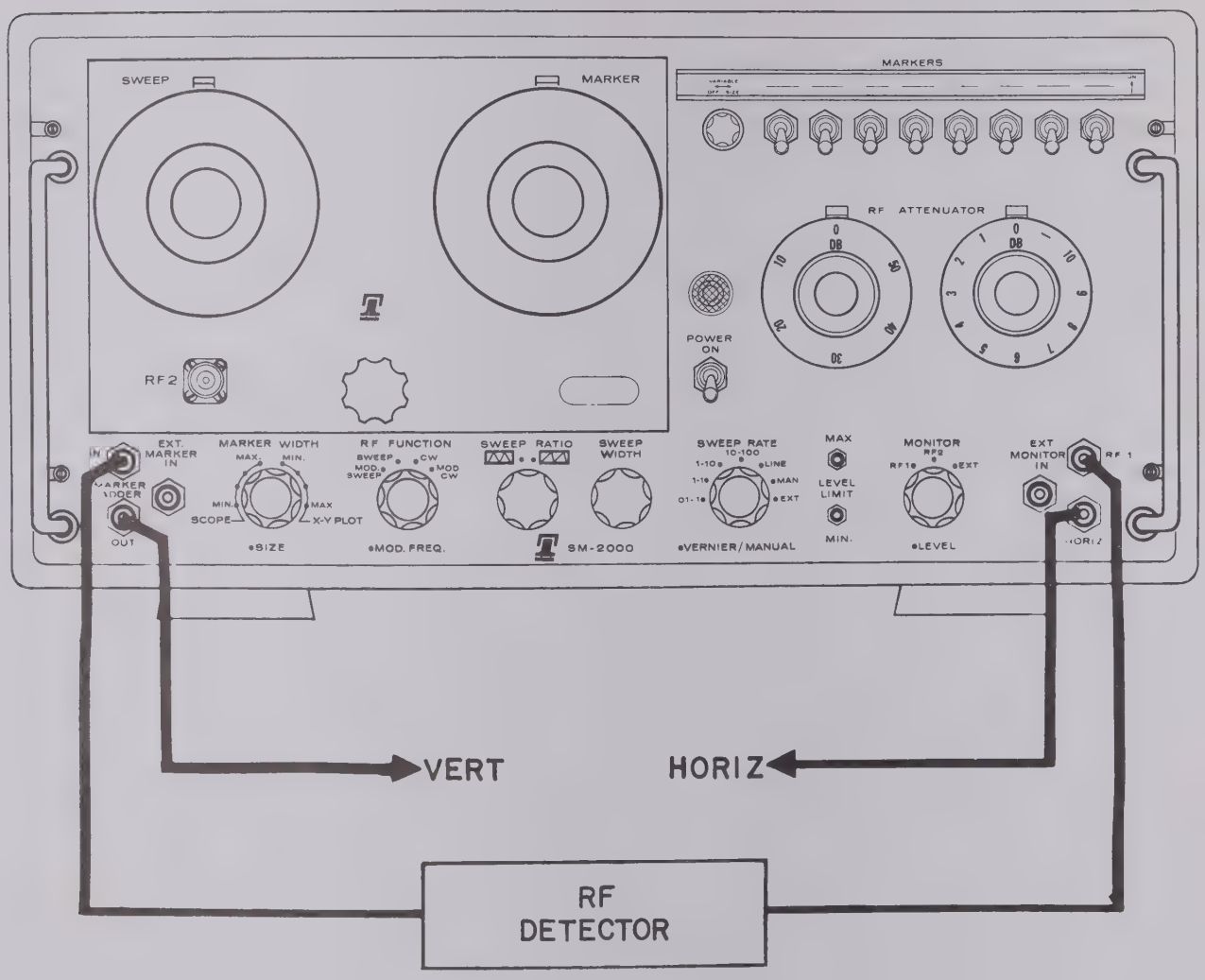
FIXED MARKERS

The sweep sample fed to plug-in marker units is the fundamental (RF 1) oscillator output. This results in a marker at the fundamental frequency on the RF 1 output and at the third harmonic on the RF 2 output. Thus a 50 Mc harmonic marker unit will mark at 50 Mc intervals on the demodulated RF 1 response curve but at 150 Mc intervals on the RF 2 trace.

Similarly a fixed frequency marker will indicate the nominal frequency on the RF 1 trace and the third harmonic of that frequency on the RF 2 trace.

SECTION IV . . CALIBRATION PROCEDURE

TYPICAL SET UP



NOTE

For greater accuracy, certain adjustments (specified in the text) should be performed with a power meter replacing the detector and scope in the above setup.

GENERAL

The following procedure should be applied after changing any component in the E-1 plug-in oscillator or at any time the calibration is noted to be incorrect.

Complete calibration of the E-1 involves adjustment of two classes of controls.

Those located in the E-1 which affect the operation of the control chassis.

Those located in the control chassis which affect the operation of the E-1.

NOTE: Although preliminary adjustments may be made with the cover removed from the oscillator section, final adjustment requires that the cover be in place. See chassis layout in schematic section for location of adjustments.

TEST EQUIPMENT

50Mc harmonic marker (such as the Telonic Model CDH-50)
5Mc harmonic marker (such as the Telonic Model CDH-5.0)
50Ω RF power meter
RF detectors (see Telonic literature for recommended detectors)
Oscilloscope

PROCEDURE

1. Make connections as shown.

2. Use double-shielded (RG) 50Ω cable for all RF connections to insure good connections and minimum radiation, and to avoid pickup of spurious signals. The detector must match the 50Ω cable, or a matching network must be used.

3. With power OFF, plug in the E-1 and secure in place.

4. Turn power ON, allow a 30 minute warmup period, and make adjustments as outlined.

SWEEP WIDTH (Adjustment)

This adjustment is set to provide 10% sweep width. Since the percent of sweep width increases only very slightly with frequency, a 10% setting at 500 Mc assures sufficient sweep width at all frequencies.

Preset the following controls:

Control Chassis
- SWEEP WIDTH fully clockwise
- RF FUNCTION Switch to SWEEP
- MONITOR Switch to RF 1
- 5 Mc harmonic marker ON
- All other markers OFF

E-1
- Sweep dial to 500 Mc

Adjust E-1 SWEEP WIDTH Control for ten full marker intervals on the scope. This can be accomplished accurately by alternately adjusting the SWEEP dial and SWEEP WIDTH Control to place a marker at each end of the trace with nine markers between. Due to some non-linearity in the sweep, the SWEEP dial will not read exactly 500 Mc at the conclusion of this adjustment.

BLANKING PHASE (Adjustment)

After the sweep width adjustment, this control is set for a rectangular pattern. Misadjustment will result in a pattern similar to the following:

HORIZONTAL PHASE (Adjustment)

After completing the blanking phase adjustment, set this control for the best linearity possible, still maintaining a reasonably rectangular pattern. See LINEARITY CHECK below. If necessary, readjust the BLANKING PHASE Control following this adjustment.

LINEARITY CHECK

Linearity measurements are made over the center 80% of the display at 10% sweep width.

Leave controls set as at the conclusion of the HORIZONTAL PHASE adjustment.

Locate the shortest marker interval in the center 80% of the display. Adjust the horizontal gain control on the scope so that this interval occupies exactly one scope division. See Figure A below. Locate the longest marker interval in the center 80% of the display. Adjust the horizontal position on the scope so that the marker interval begins on a graticule line. See Figure B below. Measure the marker interval. Its length (in scope divisions) indicates the linearity ratio: A length of 1.15 scope divisions for the longest marker interval represents a linearity of 1.15 to 1.

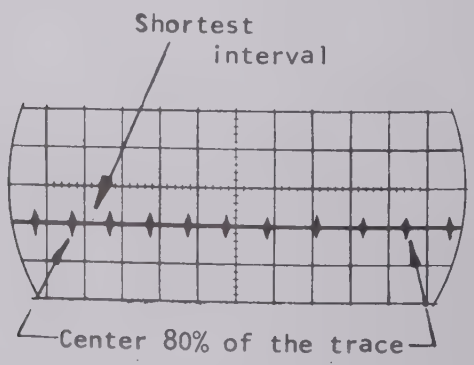


Figure A

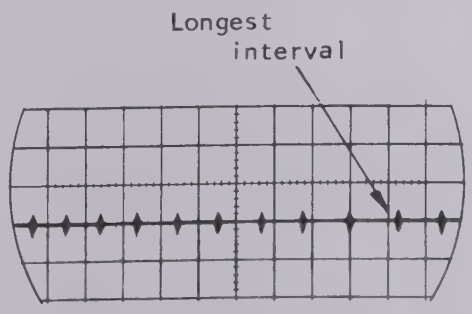


Figure B

SWEEP B+ (Adjustment)

This control limits the maximum oscillator B+ to a safe operating level. It is set for rated RF output.

1. Connect the RF 1 output to a 50Ω RF power meter.

2. Preset the following controls:

   Control Chassis
   - RF FUNCTION Switch to SWEEP
   - SWEEP WIDTH fully counter-clockwise
   - MONITOR Switch in EXT position
   - LEVEL fully clockwise
   - MAX LEVEL LIMIT for maximum output
   - RF ATTENUATORS to 0 db position

   Plug-In Oscillator
   - SWEEP B+ fully counter-clockwise
   - SWEEP Dial for frequency at which output is lowest

3. Adjust the SWEEP B+ for just over 10 mw output (1/2 of the 20 mw rated output, allowing for 50% duty cycle of the sweep oscillator).

4. Connect the power meter to RF 2. Again use the SWEEP Dial to locate the minimum output. If this is less than 625 μw, raise the SWEEP B+ setting enough to exceed this figure slightly.

   NOTE: A fixed B+ limit is used in the CW, MOD CW Modes.

MAX and MIN LEVEL LIMIT (Control Chassis)

The procedure outlined in the Control Chassis Manual for setting these controls is repeated here, with additional information peculiar to operation with the E-1.

The settings of these controls will be different for RF 1 and RF 2 outputs if a calibrated level is to be maintained. Thus, if the controls have been set for RF 1 output of 1 vrms (power meter reading of 10 mw) and desired LEVEL Control range, it will be necessary to readjust these controls for RF 2 output of 0.25 vrms (power meter reading of 625 μw) and desired range.

1. With the power meter still connected and controls set as at the conclusion of the SWEEP B+ Adjustment, adjust the MAX LEVEL LIMIT for rated output.

2. Disconnect the power meter and reconnect scope and detector as shown in TYPICAL SETUP.

3. Insert fixed attenuation in an amount equal to the desired range (not exceeding 6 db) of the LEVEL Control. For the RF 1 output, the attenuators in the Control Chassis should be used. For the RF 2 output, the use of a fixed single-pad coaxial attenuator, flat over the RF 2 range, is recommended.

4. Note the level of the scope pattern.

5. Remove attenuation, rotate LEVEL Control fully counter-clockwise. Set MIN LEVEL LIMIT for same scope deflection as seen in Step 4.

FLATNESS CHECK

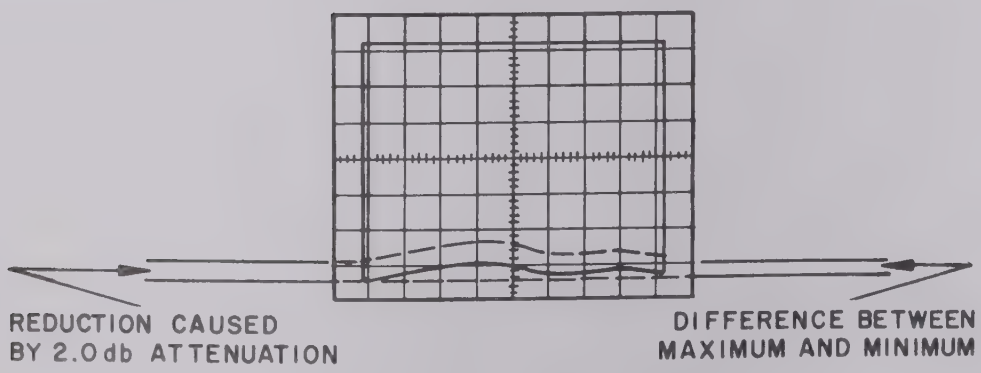
Flatness is measured over the full swept range of the E-1. Over this range, the minimum output must be no more than 2.0 db lower than the maximum.

1. With controls set as above, rotate the LEVEL and SWEEP WIDTH Control fully clockwise.

2. Rotate the SWEEP Dial throughout the full swept range of the E-1.

3. Note the difference between maximum and minimum output levels.

4. Insert a known quantity of attenuation (preferably 2.0 db) and compare the reduction in output with the noted difference between maximum and minimum. With RF 2 output the attenuator should be similar to that described for such use in the preceding adjustment operation. The difference between maximum and minimum output must be no more than the signal reduction caused by 2.0 db of attenuation.



VARIABLE MARKER CHECK

Although there are no adjustable electrical components in the variable marker circuit to compensate for dial inaccuracies, the following procedure can be used to restore specified dial accuracy when tube replacement is necessary:

> NOTE: All marker dial calibrations are made with the tube well-seated in the socket. If the tube is positioned otherwise, the high frequency end of the range will be shifted.

1. Obtain several 6AF4A tubes which have been aged several days with filaments continually burning.

2. Turn on both harmonic markers and the variable marker. Check the marker dial accuracy at the lowest frequency setting by superimposing the variable marker over the appropriate harmonic marker. If calibration at this point is incorrect, loosen the set screw holding the knob and dial assembly to the tuning shaft and rotate the dial to bring the proper dial mark under the indicator hairline.

3. Similarly check the marker dial accuracy at the highest frequency setting. If dial is inaccurate, select a tube from the aged stock which will restore accuracy at this point. Usually the effect of tube selection on the high frequency end is considerable, but negligible on the low frequency end.

4. Recheck each end of the range as above until best possible overall accuracy is obtained.

Factory recalibration service is also available.

SECTION V .. MAINTENANCE

GENERAL PROCEDURE

Since this is a plug-in unit, many of the possible malfunctions of the oscillator are the result of part failure in the control chassis. The connections at P601 of the plug-in oscillator and at J601 of the control chassis afford a convenient means of tracing the source of troubles to the oscillator or chassis.

In locating troubles which have been traced to the oscillator, application of the common rules of electronic maintenance, including a visual check for damage, open filaments, glowing anodes, shorted tuning capacitors, and charred resistors, is an obvious measure. All connectors, particularly P601 and J601 should be checked for cleanliness.

EXTENSION CABLE

For maintenance work requiring access to parts located on the under side of the plug-in or in other areas not easily reached, an extension cable may be obtained from Telonic Industries, Inc. This cable, having the 32-contact plug on one end and the 32-contact jack on the other, allows the oscillator to be removed from the control chassis and operated on the bench.

ACCESS TO RF COMPARTMENT

To take off the top cover of the oscillator compartment, remove the necessary screws.

> CAUTION: The red-lacquered screws securing the drive motor to the bottom of the compartment should not be disturbed. The position of this drive motor is critical, and these mounting screws are factory adjusted for optimum oscillator performance.

The following chart will be of service in deciding whether a trouble lies in the oscillator or control chassis.

It is assumed that the above procedures have been applied and that the jumpers on P601 are intact. Where "inconclusive" is shown, the next step should be followed.

			PROBABLE TROUBLE	
SYMPTOM	CHECK (on P601)	IF RESULT IS	OSCILLATOR	SM-2000
Weak or no output or unleveled output	DC voltage at Pin 31 with RF LEVEL fully clockwise.	High 100-175v	X	
		Low or zero 0-100v		X
RF 2 output	RF 1 output	Leveled RF 1 output	X	
		RF 1 output not level		X
No sweep width	Resistance between Pins 27 and 9, 26 and 27, 26 and ground	Open between 27 and 9	X	
		26 and 27		X
		26 and ground	X	
		Continuity on all checks		X
No variable marker (plug-in marker present)	1. For birdy at Pin 17	Birdy present		X
		No birdy	Inconclusive. See Check #2.	
	2. DC voltage at Pin 1	100v	X	
		Low or no voltage		X

If the chart shows that the trouble probably is in the control chassis, refer to the MAINTENANCE Section of the manual for that unit. A common trouble is unleveled RF 1 output due to failure of the monitor diode in the control chassis. This part can be replaced as necessary by following the procedure outlined in the control chassis manual.

If the trouble appears to be in the plug-in, the following chart may be of assistance in localizing the failure.

SYMPTOM	CHECK
Both outputs weak, absent, or unleveled	V701 and associated components
Low RF 2 output (RF 1 output normal)	CR701; CR702
No sweep width	Resistance, P601-26 to ground; R605
No variable marker	Connect an external CW source within the variable marker range to the EXT MARKER input of the control chassis and check for a birdy. If a birdy appears with the external CW source, but not with the variable marker, the variable marker oscillator is probably inoperative. Check V801, then other components if necessary.

SECTION VI . . ELECTRICAL PARTS LIST

Electrical Parts List

Circuit Ref	Description	Typical Manufacturers	Manufacturers Part No.	Telonic Part No.
C601	CFP, 0.1µf, ±20%, 200 VDCW	Aerovox	V84C-V161	22-0090-01
C602	CFD, 0.005µf, +80-20%, 500 VDCW	RMC	Type SM	22-0011-01
C603	Same as C602			
C701	CVA	Telonic		16-0089-01
C702	CVA	Telonic		16-0066-01
C703	CVA	Telonic		14-0293-01
C704	CVA	Telonic		16-0065-01
C705	Same as C704			
C706	Same as C704			
C707	Same as C704			
C708	Same as C704			
C709	CFCF, 1000pf, 500 VDCW	Aerovox	BSF1BB	21-0013-01
C710	Same as C709			
C711	Same as C709			
C712	CFC, 100pf, 500 VDCW	Erie Resistor	666-004-100	21-0007-04
C713	CFC, 20pf, 500 VDCW	Erie Resistor	666-004-20	21-0023-01
CR701	DSD, 1N25A	Sylvania	1N25A	41-0007-01
CR702	DSD, 1N831	Sylvania	1N831	41-0046-01
J701	RJ, UG-447/U	Dage Elect	UG/447/U	44-0019-01
J702	JC, UG-535/U	Dage Elect	UG/535/U	44-0006-01
J703	Part of Z701			
J704	RJ, 4867-1	Dage Elect	4867-1	44-0027-01
P701	PC, UG-88C/U	Dage Elect	UG-88C/U	44-0013-01
P702	Same as P701			
P703	Same as P701			
P704	RJ, 4961-6	Dage Elect	4961-6	44-0023-01
L701	IF, Tuned Line	Telonic		16-0027-01
L702	Same as L701			
L703	IF, Coupling Strap	Telonic		43-0023-01
L704	IF, Tuned Line	Telonic		16-0049-01
L705	IF, Tuned Line	Telonic		16-0035-01
L706	IF, Tuned Line	Telonic		16-0050-01
L707	Same as L706			
L708	Same as L706			
L709	Same as L703			
L710	IF, 2.2µh	Wilco Corp	209-11	32-0004-01
L711	Same as L710			
L712	Same as L703			
L713	Same as L710			
L714	IF, 1.0µh	Wilco Corp	205-11	32-0004-02
R601	RVC, 50kΩ, ±10%, 0.2W	CTS	UPE FH4551	29-0015-02
R602	RVC, 10kΩ, ±10%, 0.3W	CTS	UPE KA4350	29-0015-10

Electrical Parts List (Cont)

Circuit Ref	Description	Typical Manufacturers	Manufacturers Part No.	Telonic Part No.
R603	RFC, 56kΩ, ±10%, 1/2W (SC)	Allen-Bradley	EB5631	26-0071-01
R604	RFC, 100kΩ, ±10%, 1/2W	Allen-Bradley	EB1041	26-0028-01
R605	RVW, 25Ω, 5W	CTS	Type LT	29-0042-01
R606	Same as R601			
R607	RFC, 5.6kΩ, ±10%, 1/2W (SC)	Allen-Bradley	EB5621	26-0022-01
R608	RFW, 2Ω, ±5%, 5W	Sprague	243E2R05	28-0099-01
R609	RFC, 220kΩ, ±10%, 1/2W	Allen-Bradley	EB2231	26-0044-01
R701	RFC, 3.9kΩ, ±10%, 1/2W	Allen-Bradley	EB3921	26-0040-01
R702	RFC, 51Ω, ±5%, 1/2W	Allen-Bradley	EB5105	26-0003-01
R703	RFC, 220Ω, ±10%, 1/2W	Allen-Bradley	EB2211	26-0039-01
R706	RFC, 47Ω, ±10%, 1/2W	Allen-Bradley	EB4701	26-0055-01
R707	RFC, 120Ω, ±10%, 1/8W	Allen-Bradley	BB1211	26-3024-01
R708	RFC, 100kΩ, ±10%, 1/2W (SC)	Allen-Bradley	EB1041	26-0028-01
V701	TE 6DZ4	Sylvania	6DZ4	42-0049-01
Z701	Filter, low pass	Telonic		97-7010-01
Z702	Drive Motor	Telonic		36-0048-01
	VARIABLE MARKER (E-1M ONLY)			
C801	CFC, 10pf, ±10%, 1000 VDCW	Centralab	DA-726	21-0008-01
C802	CFN, 0.27pf, ±10%, 500 VDCW	Quality Components	Q.C.-1.2	22-0043-01
C803	CFCF, 1000pf, ±20%, 500 VDCW	Aerovox	CFM	21-0016-01
C804	Same as C803			
C805	Same as C803			
C806	CFCF, 1000pf, ±20%, 500 VDCW	CTS	Type SM	21-0004-01
J801	TC, MX-168A/U	Dage Elect	MX-1684A/U	44-0048-01
P801	RJ, 4961-6	Dage Elect	4961-6	44-0023-01
L801	IV, Tuned Line Made up of:	Telonic		
	Coil Form			33-0062-01
	Phenolic Plate			09-4526-01
L802	IF	Telonic		34-0036-01
L803	If, 2.2μh	Wilco Corp	209-11	32-0004-01
L804	Same as L803			
L805	2.2μh	Speer Carbon	10100-34	32-0003-01
R801	RFC, 2.2kΩ, ±10%, 1/2W	Allen-Bradley	EB2221	26-0020-01
R802	Same as R801			
R803	RFC, 56Ω, ±5%, 1/2W	Allen-Bradley	EB5605	26-0053-01
R804	RFC, 68Ω, ±5%, 1/4W	Allen-Bradley	CB6805	26-1574-01
R805	RFC, 150Ω, ±5%, 1/4W	Allen-Bradley	CB1515	26-1575-01
R806	Same as R804			
R807	RFC, 1kΩ, ±10%, 2W	Allen-Bradley	HB1021	28-0047-01
V801	Same as V701			

ABBREVIATION CODE

CFP	Capacitor, fixed, paper
CFD	Capacitor, fixed, Discap.
CFC	Capacitor, fixed, ceramic
CFCF	Capacitor, fixed, ceramic feed-thru
CFN	Capacitor, fixed, composition
CFT	Capacitor, fixed, Teflon
CVA	Capacitor, variable, air
DSD	Device, semiconductor diode
IF	Inductor, fixed
IV	Inductor, variable
JC	Jack, cable
NA	Not assigned
PC	Plug, cable
RFC	Resistor, fixed, composition
RJ	Receptacle, Jack
RVC	Resistor, variable, composition
RVW	Resistor, variable, wirewound
SC	This part subject to change
TC	Terminator, cable
TE	Tube, electron

SECTION VII
SCHEMATIC DIAGRAMS

SCHEMATIC PART DESIGNATION

C	Capacitor
CR	Crystal Rectifier
J	Jack
L	Inductor
P	Plug
R	Resistor, Fixed or Variable
V	Tube
Z	Miscellaneous

SCHEMATIC VALUE ABBREVIATION

Ω	ohms
K	1,000 ohms
M	1,000,000 ohms (megohms)
µf	Microfarad
pf	Picofarad
µh	Microhenry
mh	Millihenry

OTHER ABBREVIATIONS

F.P.	Front Panel
R.P.	Rear Panel
T.P.	Test Point

RESISTORS - All resistors are 1/2 watt, ±10%, and are shown in ohms, unless otherwise specified.

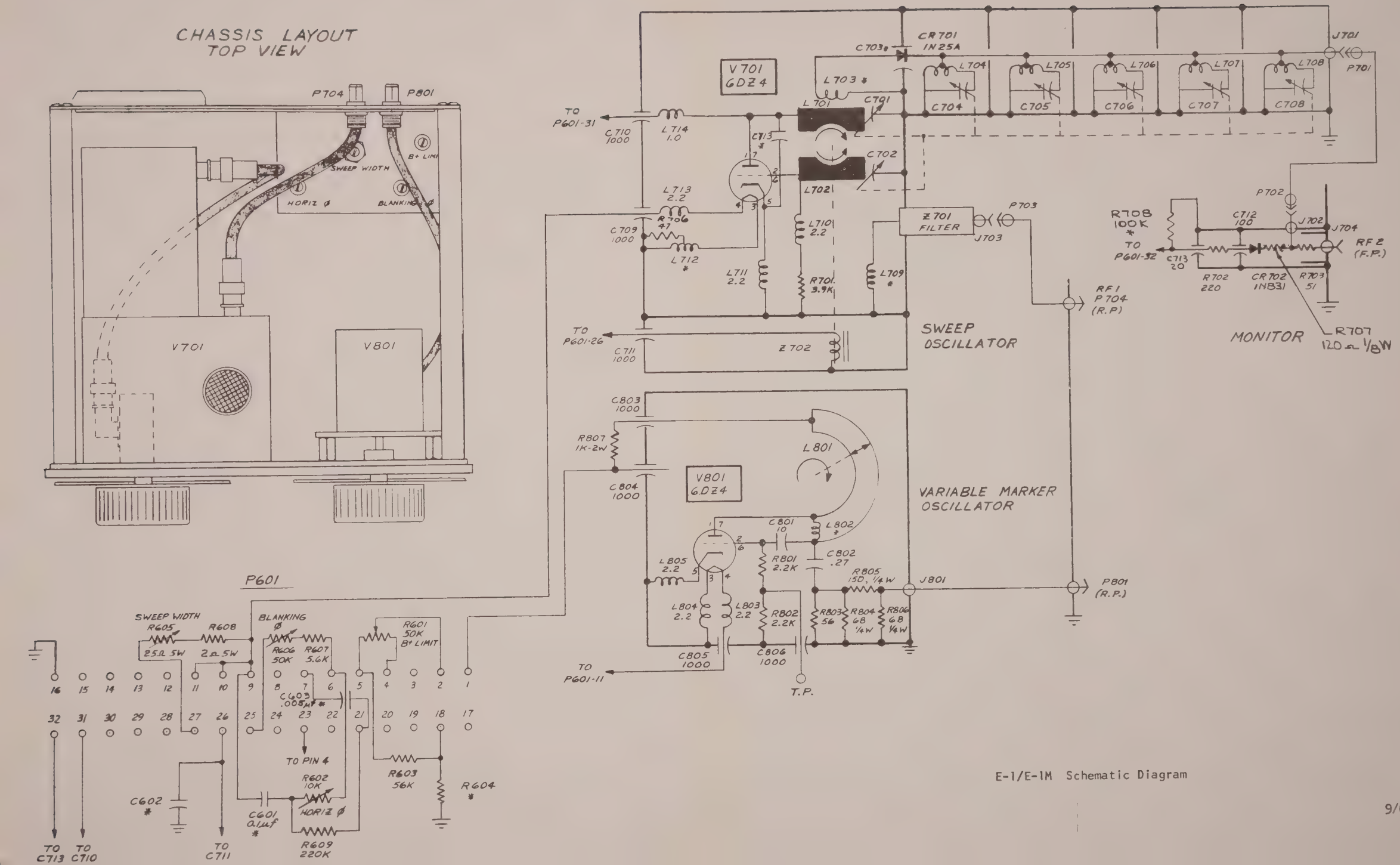
CAPACITORS - All capacitors are shown in picofarads (pf) unless otherwise specified.

COILS - All inductors are shown in microhenries (µh) unless otherwise specified.

CIRCUIT REFERENCE SYMBOL - LOCATION INFORMATION

601 - 699	Interconnecting elements
701 - 799	Sweep Oscillator
801 - 899	Variable Marker

* Indicates value of component adjusted at factory, and may deviate from value shown on print.



E-1/E-1M Schematic Diagram

9/66

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INDUSTRIES, INC. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

CUSTOMER RETURN OF EQUIPMENT (REPAIR, REPLACEMENT, DUPLICATION, OTHER CREDIT)

All customer returns require authorization from Telonic Industries, Inc. prior to shipment of equipment (Request for Equipment Return, Form #4019). Any equipment returned without authorization for shipment will be at the customer's or distributor's expense.

Instructions for Processing "Request for Equipment Return", Form #4019:

1. Customer completes top portion of Form #4019.

2. Customer forwards original and one carbon copy of Form #4019 to Telonic Industries, Inc.; retain 3rd carbon copy of Form #4019 in customer file.

3. Telonic Industries, Inc. completes bottom portion of Form #4019 and authorizes return of equipment (if approved).

4. Telonic Industries, Inc. returns the authorized original copy of Form #4019 to customer with instructions for shipment of equipment. Telonic Industries, Inc. retains one carbon copy of Form #4019 in file.

REQUEST FOR EQUIPMENT RETURN

CUSTOMER NAME: _____ DATE: _____

SHIP TO ADDRESS: _____ ORIGINAL P. O. NO: _____

_____ ORIGINAL INVOICE NO: _____

ITEM	QTY.	DESCRIPTION	MODEL NUMBER	SERIAL NUMBER	UNIT PRICE	TOTAL

REASON FOR RETURN:

RETURN FOR:

- ☐ Repair-Warranty (no charge)
- ☐ Repair-Out of Warranty (charge)
- ☐ Repair-Demo (no charge)
- ☐ Replacement (no charge)
- ☐ Replacement (charge)
- ☐ Demo (credit only)
- ☐ Duplication (credit only)
- ☐ Other (specify) _____

☐ INSURE AT CUSTOMER EXPENSE (Specify agent) _____

(TO BE COMPLETED BY TELONIC)

SHIPPING INSTRUCTIONS:

Ship via:

- ☐ Air Freight
- ☐ Sea Freight
- ☐ Air Parcel Post
- ☐ Parcel Post
- ☐ Truck
- ☐ UPS
- ☐ Air Express
- ☐ Other (specify) _____

- ☐ Prepaid
- ☐ Collect

☐ INSURE AT TELONIC EXPENSE (Property of Telonic only) Agent: _____

COMMENTS:

RETURN AUTHORIZED: _____ DATE: _____

Telonic Industries, Inc.
P. O. Box 277
Laguna Beach, California, USA 92652

REQUEST FOR EQUIPMENT RETURN

CUSTOMER NAME: _____ DATE: _____

SHIP TO ADDRESS: _____ ORIGINAL P. O. NO: _____

_____ ORIGINAL INVOICE NO: _____

ITEM	QTY.	DESCRIPTION	MODEL NUMBER	SERIAL NUMBER	UNIT PRICE	TOTAL

REASON FOR RETURN:

RETURN FOR:
- Repair-Warranty (no charge) ☐
- Repair-Out of Warranty (charge) ☐
- Repair-Demo (no charge) ☐
- Replacement (no charge) ☐
- Replacement (charge) ☐
- Demo (credit only) ☐
- Duplication (credit only) ☐
- Other (specify) ☐ _____

INSURE AT CUSTOMER EXPENSE ☐
(Specify agent)
_____

(TO BE COMPLETED BY TELONIC)

SHIPPING INSTRUCTIONS:

Ship via:
- Air Freight ☐
- Sea Freight ☐
- Air Parcel Post ☐
- Parcel Post ☐
- Truck ☐
- UPS ☐
- Air Express ☐
- Other (specify) ☐ _____

Prepaid ☐
Collect ☐

INSURE AT TELONIC EXPENSE ☐ (Property of Telonic only) Agent: _____

COMMENTS:

RETURN AUTHORIZED: _____ DATE: _____

Telonic Industries, Inc.
P. O. Box 277
Laguna Beach, California, USA 92652

REQUEST FOR EQUIPMENT RETURN

CUSTOMER NAME: _____ DATE: _____

SHIP TO ADDRESS: _____ ORIGINAL P. O. NO: _____

_____ ORIGINAL INVOICE NO: _____

ITEM	QTY.	DESCRIPTION	MODEL NUMBER	SERIAL NUMBER	UNIT PRICE	TOTAL

REASON FOR RETURN:

RETURN FOR:
- Repair-Warranty (no charge) ☐
- Repair-Out of Warranty (charge) ☐
- Repair-Demo (no charge) ☐
- Replacement (no charge) ☐
- Replacement (charge) ☐
- Demo (credit only) ☐
- Duplication (credit only) ☐
- Other (specify) ☐ _____

INSURE AT CUSTOMER EXPENSE ☐
(Specify agent)
_____

(TO BE COMPLETED BY TELONIC)

SHIPPING INSTRUCTIONS:

Ship via:
- Air Freight ☐
- Sea Freight ☐
- Air Parcel Post ☐
- Parcel Post ☐
- Truck ☐
- UPS ☐
- Air Express ☐
- Other (specify) ☐ _____

Prepaid ☐
Collect ☐

INSURE AT TELONIC EXPENSE ☐ (Property of Telonic only) Agent: _____

COMMENTS:

RETURN AUTHORIZED: _____ DATE: _____

Telonic Industries, Inc.
P. O. Box 277
Laguna Beach, California, USA 92652